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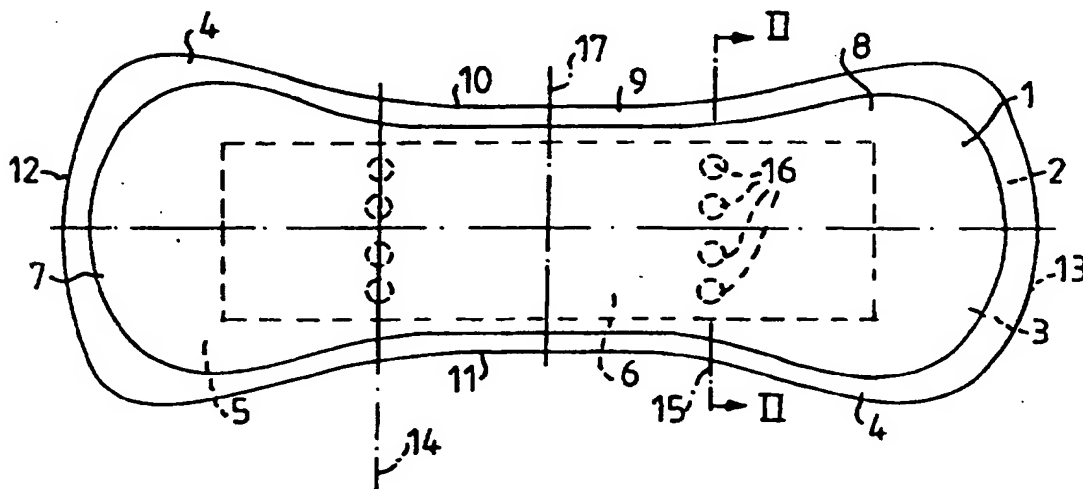
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(57) Abstract

An absorbent article which includes a first liquid-permeable outer surface (1, 101), a second liquid-impermeable outer surface (2, 102), and an absorbent body (3, 103) disposed between the two outer surfaces (1, 101; 2, 102), and which further includes a transverse direction and a longitudinal direction and has at least one fold line (14, 15, 124) which extends through the article in plane therewith and along which the article can be folded. The article is mainly characterized in that it includes a layer of material (6, 106) in which at least one fold directive (16, 119, 120, 122, 123) in the form of an opening, slot, or recess is arranged along the fold line (14, 15, 124) through the article.

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A FOLDABLE ABSORBENT ARTICLE

TECHNICAL FIELD

5 The present invention relates to an absorbent article, such as a sanitary napkin, a diaper, an incontinence guard or the like. Such an article includes a liquid-permeable first casing sheet, a liquid-impermeable second casing sheet and an absorbent body disposed between the two casing sheets. The
10 article also has a transverse direction and a longitudinal direction and at least one fold line which extends through the article in the plane of said article and along which the article can be folded.

15 BACKGROUND OF THE INVENTION

It has become progressively more usual to fold absorbent articles, such as sanitary napkins, diapers, incontinence guards and like articles, after manufacture and prior to
20 packaging the articles. The article is folded for several different reasons. For instance, it is often desirable to reduce the article to a size and format which can be handled by the user. A suitably folded absorbent article can be carried readily by the user in a handbag or in a pocket, for
25 later use. Furthermore, it is necessary generally to fold the articles so that they can be packaged in a rational space-lean fashion.

In the case of sanitary napkins in particular, it is usual
30 for each napkin to be packaged individually in a separate envelope-like packaging unit. Such individual packages are easier to handle than packages which contain a large number of articles. Furthermore, individual packages are hygienic and prevent the article from being dirtied when kept, for
35 instance, in a handbag prior to using the article. After use, the individual article packaging unit can be used to wrap the article when throwing the article away.

One serious problem encountered when folding absorbent articles is that folding deforms the articles and impairs their absorption properties. Absorbent articles of the kind intended here are soft and pliable. As the article is folded, permanent pleats and wrinkles are formed in the article. When these pleats, folds and wrinkles are formed at particularly unsuitable locations in the article, they are able to function as liquid conduits which facilitate the flow of liquid out of the article, past the edges thereof. This drastically reduces security of the article against leakage, which is obviously most unsuitable. Furthermore, folding of the article has a negative influence on the appearance of the articles. Articles which have newly been removed from their packaging units for use have a mishandled appearance, which, of course, makes the article less attractive from an aesthetic point of view.

Another serious problem associated with folding absorbent articles to a size suitable for individual packaging resides in achieving sufficient preciseness and reproducibility with regard to folding. Articles of this kind are manufactured in machines which produce a very large number of articles per unit of time from a moving web. This manufacture is thus concerned with high transportation speeds, both when manufacturing the articles and when folding said articles to packaging sizes. Since such articles are relatively light in weight, the positions of said articles can be disturbed by the air currents and other disturbances occurring in the machine during transportation of the articles along the manufacturing path. It is therefore impossible to guarantee that the articles will be folded mutually in an identical fashion, which contributes to the formation of pleats, folds and wrinkles at unsuitable locations in the article. Furthermore, the actual packaging process is, of course, influenced negatively when the shapes and sizes of the folded articles vary. In the worst case, it is necessary to scrap wrongly

folded articles, since they do not coincide with the predetermined packaging format.

5 It is earlier known to provide fold directives in an absorbent article, in the form of heavily compressed parts or lines in an absorbent layer. This is generally referred to as compression. Fold directives of this kind generally extend longitudinally and function to give the article a desired shape in use. It is known in particular to provide fold
10 directives at the edge parts of a sanitary napkin or a diaper. The article is compressed between the wearer's thighs in use. As a result of the fold directives, the article will therewith adopt a suitable basin-like configuration in which liquid is collected and which has upwardly folded edge-parts.
15 Heavily compressed parts, or lines, are also used to provide for improved and controlled transportation of liquid in the article. Because liquid is transported more rapidly in a more compact structure having small cavities than in a surrounding structure having larger cavities, it is possible, for
20 instance, with the aid of longitudinally extending compressed lines in an absorbent body to disperse absorbed liquid in the longitudinal direction of the article and therewith reduce the risk of transporting liquid to the longitudinal edges of the article. However, fold directives that are formed by
25 compression are hard and stiff and can cause the article to be uncomfortable when worn. Sharp chafing corners are able to form on the article, particularly when the article is folded several times and one or more folds are effected at right angles to a compression line. The use of compressed
30 fold directives in the transverse direction of the article is not feasible, since these indications would provide particularly effective transportation routes which would conduct absorbed liquid past the side-edges of the article.

DISCLOSURE OF THE INVENTION

The present invention, however, provides an absorbent article of the kind mentioned in the introduction in which the negative effects of folding the article have been considerably reduced. An article constructed in accordance with the invention is mainly characterized in that the article has a layer of material which includes at least one fold directive in the form of an opening, slot or recess disposed along the fold line through the article.

In accordance with a preferred embodiment of the invention, the absorbent body includes a first absorption layer which is disposed inwardly of the liquid-permeable outer surface, and a second absorption layer which is disposed between the first absorption layer and the liquid-impermeable outer surface, wherein the opening, slot or recess is provided in the second absorption layer. The manufacture of a suitable material for the second absorption layer is described in WO 94/10956, which teaches a method of manufacturing an absorbent structure in an absorbent article, such as a diaper, sanitary napkin, tampon, panty guard, incontinence guard, bed protector, dressings, saliva absorbent and like articles. The method is characterized by compressing particle-form material which includes flash-dried cellulose fibres that have been dry formed to a web having a surface weight of 30-2,000 g/cm² to a density of between 0.2-1 g/cm³, and by incorporating the web as an absorbent structure in an absorbent article without subsequent defibration and fluff formation. WO 94/10956 also describes a method for manufacturing a material suitable for the second absorption layer. The method according to WO 94/10956 is characterized by compressing an air-laid web of cellulose fibres to a dry-formed sheet having a first density of between 0.2-1 g/cm³, and thereafter softening the sheet mechanically to a second density which is lower than the original density and herewith delaminated, so as to form a plurality of incompletely separated thin fibre layers having

a density corresponding to the first density.

According to another embodiment, the article includes a layer of relatively stiff non-absorbent material, wherein the opening, the slot, or the recess is formed in the nonwoven absorbent material layer.

According to a further embodiment of the invention, the opening, the slot, or the recess is provided in a layer of sheet of elastically pliable material, such as plastic or plastic foam.

At least two openings, slots or recesses may be provided along one and the same fold line through the article. In this case, when the fold line extends generally in the transverse direction of the article, it is appropriate for the combined openings, slots or recesses to take-up at most about 50% of the extension of the article along the fold line. In the case of transverse fold lines, it is also appropriate for each opening, slot or recess disposed along the fold line to take-up at most about 30% of the extension of the article along the fold line, and preferably at most 20% of said extension.

In a usual embodiment of the invention, the article will have at least two generally parallel fold lines.

In another embodiment of the invention, the article has two generally orthogonal fold lines. In this case, it is particularly preferred that the article will include one opening or recess which surrounds the point at which the orthogonal fold lines intersect one another in the plane of the article.

According to another embodiment of the invention, the article includes a front part, a rear part, and a crotch part disposed therebetween, wherein body liquid or fluid discharged to the article is intended to be taken-up primarily within a limited wetting area, located generally within the

crotch part, said wetting area being free from fold lines that extend transversely across the article.

5 When the article is intended to be folded together length-wise, the article will include generally a fold line which extends along the longitudinal centre line of the article.

10 An article such as a sanitary napkin or like article is normally folded along two transverse fold lines placed essentially symmetrically on opposite sides of the article transverse centre line.

15 A number of advantages are gained when openings, slots or recesses are provided within those regions of the article that are intended to be folded together. When the openings are suitably configured and positioned, the openings will function as well-defined fold directives for folding the absorbent article.

20 By an opening in a layer of material is meant holes or pores which extend through the full thickness of the layer, from one surface of said layer to the other. A certain amount of material has been removed or displaced to one side from the layer in producing the opening. By opening is also meant here
25 all forms of indents, gashes or recesses in an edge-part where the gash, notch or recess extends through the full thickness of the layer and where material has been removed from the gash, notch or recess. Such gases, notches or recesses may have a V-shape or U-shape, or may have any other
30 suitable form.

A slit, or slot, is a through-penetrating cut or a clip in the layer of material. Essentially no material has been removed from the layer in forming the slot or slit.

35 The term recess as used here is intended to include holes, grooves or the like which do not penetrate through the layer

and with which the thickness of the layer has been reduced by removing material within the region of the recess.

Naturally, these different types of fold directives can be mutually combined in a number of different ways within the scope of the Claims. The fold directives may have a number of different shapes and sizes within one and the same category.

10 When one or more openings are disposed along a fold line through the article, the bending resistance of the article at said openings is reduced, therewith making it easier to fold the article along the fold line. The more and/or the larger the openings along a given fold line, the easier it is to fold the article along the fold line and the greater the precision and reproducibility of the fold. When the openings are provided in an absorbent layer, however, the openings should not have such a size and shape, or be present in such numbers, as to substantially obstruct desired transportation of liquid in the article. In the case of such absorbent articles as sanitary napkins which have a relatively small transverse extension, but a comparatively large longitudinal extension, it is generally desired to obstruct longitudinal liquid transportation as little as possible. At the same time, it is desirable in such articles to minimize the dispersion of liquid across the article and therewith avoid leakage of liquid or fluid past the side-edges of the article. In the case of such articles, it is therefore most often suitable from the aspect of liquid transportation for transverse fold directives in the article to occupy as little as possible of the transverse extension of the article. This will result in the minimum negative effect on the longitudinal transportation of liquid or fluid in the article. However, longitudinal fold directives can be used to reduce the dispersion of liquid in the transverse direction of the article, when found suitable.

In the case of sanitary napkins, for instance, which are normally folded together along two transverse fold lines to a length corresponding approximately to one-third of its original length, prior to packaging each sanitary napkin into an individual packaging unit, it has been found suitable to provide at least one opening at at least one fold line. The sanitary napkin will preferably include at least one opening at each fold line. In this case, the openings are disposed generally symmetrically on either side of a transverse centre line through the napkin.

According to one embodiment of the invention, at least two openings are provided along one and the same fold line through the article.

Naturally, the invention is not restricted to openings of any particular shape. The openings may have a number of different shapes, for instance round, oval, square, rectangular, triangular, rhomboidal, star-shaped, etc. The openings will preferably have a shape such that their extension in the transverse direction of the article will be equally as large or smaller than their extension in the longitudinal direction of the article. Elongated narrow openings, such as slots or slits, are less suitable in the transverse direction of the article, since such openings intersect or cut the absorption channels in the absorbent body and therewith prevent dispersion of liquid in the longitudinal direction of the article. Instead, it is preferred to provide a plurality of smaller openings, or perforations, along the contemplated fold line through the article. This provides a well-defined fold directive which has the minimum disturbing effect on the article absorption properties.

The fold directives according to the invention may also be combined with a separate layer or insert which has at least one edge that extends along a fold line through the article. This edge functions as an extra fold directive for folding

the article along the fold line and further enhances the accuracy and precision of the folding process.

BRIEF DESCRIPTION OF THE DRAWINGS

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The invention will now be described in more detail with reference to exemplifying embodiments thereof and also with reference to the accompanying drawings.

10 Figure 1 illustrates a sanitary napkin provided with inventive fold directives and shown in a flat state.

Figure 2 is a sectional view of the napkin shown in Figure 1, taken on the line II-II.

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Figure 3 illustrates the napkin of Figures 1 and 2 folded to a packaging state.

20 Figure 4 illustrates a further sanitary napkin provided with fold directives in accordance with the invention and shown in a flat state.

Figure 5 illustrates a lower absorbent core in the napkin of Figure 4 and shows the napkin partially folded.

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Figure 6 illustrates the absorbent core of Figure 5 after being folded further.

30 Figure 7 illustrates the configuration of the napkin shown in Figure 4 when folded fully to its packaging state.

DESCRIPTION

35 The sanitary napkin shown in Figure 1 is seen from the side thereof that lies proximal to the wearer in use. A liquid-permeable first casing sheet 1, made for instance of fibre material, so-called nonwoven or woven material, perforated

plastic film, net, open cell foam or like material, is mounted on that side of the napkin which is intended to lie proximal to the wearer in use. A liquid-impermeable second casing sheet 2, made for instance of plastic film, nonwoven or woven material that has been made hydrophobic, is mounted on that side of the napkin which is intended to lie distal from the wearer in use. The two casing sheets 1, 2 embrace an absorbent body 3 and are mutually joined together by welding, gluing or similarly fastening those parts 4 of the casing sheets 1, 2 that project out around the absorbent body 3.

The absorbent body 3 includes a first absorbent layer 5 which has a generally elongated hourglass shape and is mounted nearest inwardly of the liquid-permeable casing sheet 1. The first absorbent layer 5 is comprised of a soft, pliable material, suitably a material which has an intrinsic springiness and elasticity such as to enable the material to be folded together without causing cracks, fractures or sharp permanent pleats or folds to occur in the absorbent material. Examples of suitable material are different types of fibre wadding, preferably which have a given resiliency after being compressed, or cellulose fluff pulp which has been compressed to a relatively low degree. Mixtures of cellulose fluff pulp or other cellulose-based fibres with different types of synthetic fibres can also be used. Since cellulose fibres normally have a relatively low resilience when wet, it may be suitable to admix other materials which will increase the wet resilience of the material and therewith provide the first absorbent layer with a given resiliency even when in a wet state. Such materials are, for instance, different types of thermoplastic fibres or particles which when the layer is heated function as a binder to bind the fibres in the layer and therewith hold the fibres mutually in position, such that the layer will obtain a higher tensile strength and a greater resiliency both in a wet and in a dry state. The cellulose fibres may also be modified chemically so as to

elevate their intrinsic resilience, or the cellulose fibres may be mixed with highly resilient synthetic fibres.

The first absorbent layer 5 may also include a minor quantity of so-called superabsorbents, i.e. material in the form of fibres, particles, granules, film or the like, which are able to absorb and bind body liquid and fluid in quantities corresponding to several times the intrinsic weight of the superabsorbent, while forming a hydrogel.

When the napkin is in use, the first absorbent layer 5 is intended to receive and transport body liquid to a second absorbent layer 6 which lies inwardly of the absorbent layer and nearest the liquid-impermeable casing sheet 2. The liquid, or fluid, is passed to the second absorbent layer 6 by capillary action and by the force of gravity. The material in the first absorbent layer 5 will preferably have a high instantaneous absorption ability, so that discharged body liquid will be absorbed quickly into the layer 5 and accommodated therein until the liquid has gradually passed into the second absorption layer 6, which normally has a lower absorption rate but a higher body liquid affinity.

The second absorbent layer 6 is comprised of a stiffer material having a higher density and a high liquid-dispersing and liquid-retaining capacity. A particularly suitable material of this kind is described in WO 94/10956. A similar type of material but one which has properties that are particularly suitable for blood absorption is described in WO 94/10953. Conventional compressed layers of cellulose fluff pulp, absorbent foam material or different types of tissue laminates are also usable. Absorbent material which has a high liquid-dispersion capacity and a high liquid-retention capacity often has a high density and is comparatively flexurally rigid and relatively inelastic. Absorption layers comprised of such material are sensitive to compression forces, since there is a danger that these materials

will be deformed permanently by compression such as to form sharp pleats or folds and ruptures or discontinuities in the absorbent material. The liquid-dispersing ability of the material is therewith reduced, because a crack or a rupture in the layer forms a barrier against dispersion of liquid in a direction perpendicular to the crack or rupture. Another danger is that pleats or folds formed in the absorbent body will function as liquid-dispersing conduits which conduct liquid out of the absorbent body, resulting in leakage.

10

The second absorbent layer is generally rectangular and has a smaller extension in the plane than the first absorbent layer. The second absorbent layer is hereby surrounded on all sides by a softer material having a lower liquid-dispersion ability. This arrangement provides several advantages. Firstly, no sharp or hard edges on the second absorbent layer can come into contact with the wearer's body and chafe or irritate the wearer's skin; and, secondly, it counteracts the passage of liquid to the edges of the napkin in the second absorbent layer, thereby greatly decreasing the risk of body liquid leaking from the napkin. Furthermore, the permanent pleats or folds that are formed in the absorbent body when folding the napkin are less pronounced in the softer, more resilient first absorbent layer. Consequently, at the edge-parts of the napkin the absorbent body is able to return essentially fully to its non-folded state, thereby preventing sharp pleats or folds in which liquid is able to run from extending right out to the side-edges of the napkin. The edges of the second absorbent layer also form fold directives around which the napkin is able to fold when compressed in the crotch region between the wearer's thighs in use. The napkin will herewith adopt in use a more three-dimensional form which better coincides with the body shape of the user in the crotch region.

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The second absorbent layer may also conveniently contain some form of superabsorbent. The amount of superabsorbent in the

second absorbent layer 6 is suitably greater than the amount in the first absorbent layer, as the second absorbent layer 6 is intended to absorb and retain the major part of the body liquid discharged.

5

The sanitary napkin also includes a front part 7, which is intended to lie forwardly of the wearer in use, a rear part 8, which is intended to lie rearwardly of the wearer in use, and a crotch part 9 disposed between the front part 7 and the rear part 8. Similar to the first absorbent layer 5, the napkin also has a generally elongated hourglass shape, wherein its front part 7 and rear part 8 are wider than the crotch part. The napkin also includes two longitudinally extending side-edges 10, 11, a front transverse edge 12 and a rear transverse edge 13.

15

The second absorbent layer 6 includes two fold lines 14, 15 which are formed from rows of small circular openings 16 arranged generally symmetrically on respective sides of a transverse centre line 17 through the second absorbent layer 6. The openings 16 form fold directives for folding the napkin to a format or size suitable for packaging purposes. Each row of openings 16 takes-up at most about 50% and preferably at most 40% of the width of the second absorbent layer, such that the layer will retain its integrity. This also enables liquid to communicate relatively unimpeded between the crotch part 9 of the napkin and the rear napkin part 8 and front napkin part 7 respectively.

20

25

Figure 3 illustrates the configuration of the napkin shown in Figures 1 and 2 after having been folded along the fold lines 14, 15 in the second absorbent layer 6. In folding the napkin, the rear napkin part 8 was first folded in over the liquid-permeable casing sheet 1, i.e. over that side of the napkin which is proximal to the wearer in use. The front napkin part 7 was then folded in over the same side of the napkin, so that in the ultimate folded state of the napkin,

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the front part 7 is located outside the rear part 8.

5 The sanitary napkin shown in Figures 1-3 is advantageously provided with conventional fastener means (not shown) for fastening the napkin inside the wearer's panties. Normally, the fastening means used comprises one or more regions of self-adhesive melt glue, so-called hot melt, provided on the liquid-permeable casing sheet. Naturally, any other type of suitable fastener means may be used. Examples of such fastener means are high friction surfaces, Velcro® strips and other types of mechanical fastener means such as straps, press studs, clamps or the like. The napkin may also be provided with separate fastener flaps which, in use, are intended to be folded around the leg edges of the wearer's panties, or underpants, and fastened to the outer surface thereof. The fastener flaps may also be produced from separate pieces of material or may comprise extensions of one or both casing sheets. The flaps may have any suitable form and size whatsoever and may be fastened to the napkin in a number of different ways.

Figure 4 illustrates another sanitary napkin which includes a liquid-permeable casing sheet 101, a liquid-impermeable casing sheet 102, and an absorbent body 103 enclosed between the casing sheets 101, 102. The absorbent body 103 includes a first absorbent layer 105 and a second absorbent layer 106 in the same way and of the same construction as the layers of the absorbent body 3 in the napkin shown in Figures 1-3. Similar to the napkin shown in Figures 1-3, the napkin shown in Figure 4 is provided with fastener means (not shown) comprised, for instance, of self-adhesive glue on that side of the liquid-impermeable casing sheet 102 which lies distal to the wearer in use.

35 The napkin has a generally elongated trapezoidal shape with a broader front part 107, a narrow rear part 108 and a crotch part 109 disposed between the front part and the rear part.

The napkin is delimited in the plane by two longitudinally extending side-edges 110, 111, a front transverse edge 112 and a rear transverse edge 113.

5 The second absorbent layer 106 has a rectangular shape and includes two slots or slits 119, 120, which extend along the longitudinal centre line 121 of the napkin, one from each transverse edge 112, 113 on the absorbent layer 106 along roughly a quarter of the length of said absorbent layer 106,
10 and terminate in a respective oval opening 122, 123. The oval openings are disposed symmetrically on respective sides of the transverse centre line 117 of the napkin and form fold directives for folding the napkin along two transverse fold lines 114, 115 through the openings 122, 123.

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Figure 5 illustrates the configuration of the second absorbent layer 106 after having folded the napkin along the rear transverse fold line 115 that extends through the oval opening 123 at the rear napkin part 108. In this case, the
20 rear napkin part 101 has been folded in over the napkin crotch part 109 on that side of the napkin which is covered by the liquid-permeable casing sheet 101.

Figure 6 illustrates the second absorbent layer 106 after having also folded the front napkin part 107 onto the liquid-permeable casing sheet 101, along the front transverse fold line 114 that extends through the oval opening 122 at the
25 front napkin part 107.

30 The napkin is then finally folded to the packaging format shown in Figure 7. This final folding procedure is effected along a third fold line 124 which extends through the longitudinal centre line 121 of the napkin and through the two slits 119, 120 and the oval openings 122, 123 in the
35 second absorbent layer 106. The napkin is held in its folded state by means of a fastener tape 125, which is removed or torn-off when the napkin is to be used.

5 The thus folded napkin is very small and compact and can be easily accommodated in a pocket or a handbag. Despite the final folding stage being effected with three layers of napkin, the folding precision and repeatability of the folding process is extremely good, due to the longitudinally extending slots and the oval openings in the second absorbent layer 106. Furthermore, the undesired and uncontrolled deformation of the sanitary napkin caused by folding the napkin is a minimum. This is due partly to the resilient material in the first absorbent layer 105, but primarily because the precision at which folding is effected imparts to the napkin a predetermined form which is the same for all sanitary napkins having the same positioning of the slots 119, 120 and the oval openings 122, 123. This circumstance can be utilized so that the slots 119, 120 and the openings 122, 123 are placed and formed such that when the napkin is removed from its packaging unit for use and unfolded, the napkin will assume an attractive and anatomically adapted three-dimensional shape.

Furthermore, the oval openings 122, 123 ensure that no sharp, chafing fold corners are formed in the relatively stiff second absorbent layer 106. Because the oval openings are placed in the intersection points between the two transverse fold lines 114, 115 and the longitudinal fold line 124, these openings will be located precisely at the fold corners 125, 126 in the folded state of the napkin. This avoids the gathering of material with subsequent pleat formation and deformation of the material that normally occurs at a fold corner. The openings 122, 123 also provide a certain expansion space for the first absorbent layer 105, whereby this layer 105 will not be deformed to the same extent as in the case of conventionally folded sanitary napkins.

35 A sanitary napkin that has been folded in the manner illustrated in Figure 7 will have a particularly suitable form

when taken into use, since the longitudinally extending last fold will cause the napkin to retain, to some extent, at its crotch part 109 the curvature imparted thereto by folding the napkin. The unfolded napkin will hereby present at the crotch

5 part 109 a soft or gentle raised part on that side of the napkin which lies proximal to the wearer in use. This ensures good contact with the wearer's body and effective transfer of body liquid between the wearer's body and the napkin. When

10 folding the napkin, the front part 107 and the rear part 108 are curved longitudinally, so that the sanitary napkin will also have a shape which coincides particularly well with the body shape of the user also in the longitudinal direction of the napkin.

15 For the sake of simplicity, the invention has been described in the foregoing with reference to sanitary napkins. It will be obvious, however, that openings and holes in accordance with the invention can also be used to facilitate folding of other absorbent articles, such as diapers and incontinence

20 guards for children and adults, bed protectors, seat protectors, absorbent dressings or like articles.

It will also be understood that the invention is not restricted to the illustrated positions and configurations of

25 the openings and slots, or slits, and that all positions and configurations of openings and slots which provide a satisfactory folding result can be used.

Neither shall the absorbent articles embraced by the invention be considered limited to the structural design described with reference to exemplifying embodiments of the invention. A number of further embodiments are conceivable within the scope of the Claims. For instance, the absorbent article may include elastic devices which assist in shaping the article

30 and/or create leakage barriers.

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In the case of sanitary napkins in particular, it may be

advantageous to include a sheet of elastically bendable material, such as a plastic, plastic foam or like material beneath the absorbent body of the napkin. The delimiting edges of the sheet will suitably coincide in the long direction of the napkin with fold lines extending transversely through the napkin. The delimiting edges hereby function as additional fold directives, which further ensure controlled folding of the napkin. In the case of the embodiment described with reference to Figures 4-7, such a sheet will mean that the rise or curvature which remains at the crotch part after folding out the napkin will be resiliently formable to the shape of the wearer's body.

The invention is thus not intended to be restricted to the above examples described, indicated or as shown in the drawings, but is intended to encompass all modifications thereof or methods within the scope of the preceding claims.

CLAIMS

1. An absorbent article which includes a first liquid-permeable outer surface (1, 101), a second liquid-impermeable outer surface (2, 102), and an absorbent body (3, 103) disposed between the two outer surfaces (1, 101; 2, 102), and which further includes a transverse direction and a longitudinal direction and has at least one fold line (14, 15, 124) which extends through the article in plane therewith and along which the article can be folded, characterized in that the article further includes a layer of material (6, 106) in which at least one fold directive (16, 119, 120, 122, 123) in the form of an opening, slot, or recess is arranged along the fold line (14, 15, 124) through the article.
2. An article according to Claim 1, characterized in that the absorbent body (3, 103) includes a first absorbent layer (5, 105) disposed inwardly of the liquid-permeable outer surface (1, 101), and a second absorbent layer (6, 106) disposed between the first absorbent layer (5, 105) and the liquid-impermeable outer surface (2, 102), wherein the fold directive (16, 119, 120, 122, 123) is provided in the second absorbent layer (6, 106).
3. An article according to Claim 1, characterized in that it includes a layer of relatively stiff non-absorbent material, wherein the fold directive (16, 119, 120, 122, 123) is provided in said non-absorbent layer.
4. An article according to Claim 2, characterized in that the second absorbent layer (6, 106) is formed from a material in particle form which includes flash-dried cellulose fibres that have been dry-formed to a web having a surface weight of 30-2,000 g/m² and compressed to a density of between 0.2-1 g/cm³; and in that the web has been incorporated in the article without subsequent defibration and fluff formation.

5. An article according to Claim 2 or Claim 4, characterized in that the second absorbent layer (6, 106) is formed from an air-laid web of cellulose fibres which has been compressed to a dry-formed sheet having a first density of between 0.2-1 g/cm³, whereafter said sheet has been softened mechanically to a second density lower than the original density and therewith delaminated to form a plurality of incompletely separated, thin fibre layers which per se have a density corresponding to the first density.

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6. An article according to Claim 1, 2 or 3, characterized in that the fold directive (16, 119, 120, 122, 123) is provided in a layer of elastically bendable material, such as a plastic or plastic foam material.

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7. An article according to any one of the preceding Claims, characterized in that at least two openings, slits, slots or recesses (16, 119, 120, 122, 123) are arranged along one and the same fold line (14, 15, 124) through the article.

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8. An article according to Claim 7, characterized in that the fold line (14, 15, 114, 115) extends generally in the transverse direction of the article; and in that the openings, slits, slots or recesses (16, 119, 120, 122, 123) take-up at most about 50% of the extension of the article along the fold line (14, 15, 114, 115).

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9. An article according to any one of the preceding Claims, characterized in that the fold line (14, 15, 114, 115) extends generally in the transverse direction of the article; and in that each opening (16, 122, 123), slot (119, 120) or recess along the fold line (14, 15, 114, 115) takes-up at most about 30% of the extension of the article along the fold line (14, 15, 114, 115) and preferably at most 20% of said extension.

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10. An article according to any one of the preceding Claims, characterized in that the article includes at least two generally parallel fold lines (14, 15; 114, 115).

5 11. An article according to any one of the preceding Claims, characterized in that the article includes two generally orthogonal fold lines (114, 115, 124).

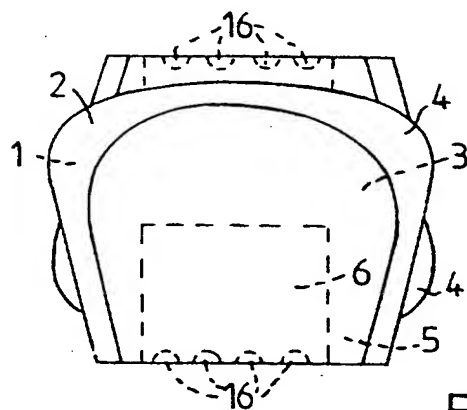
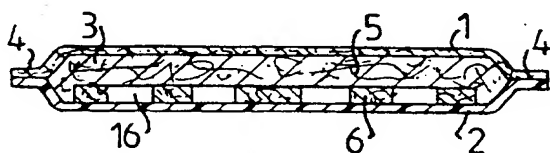
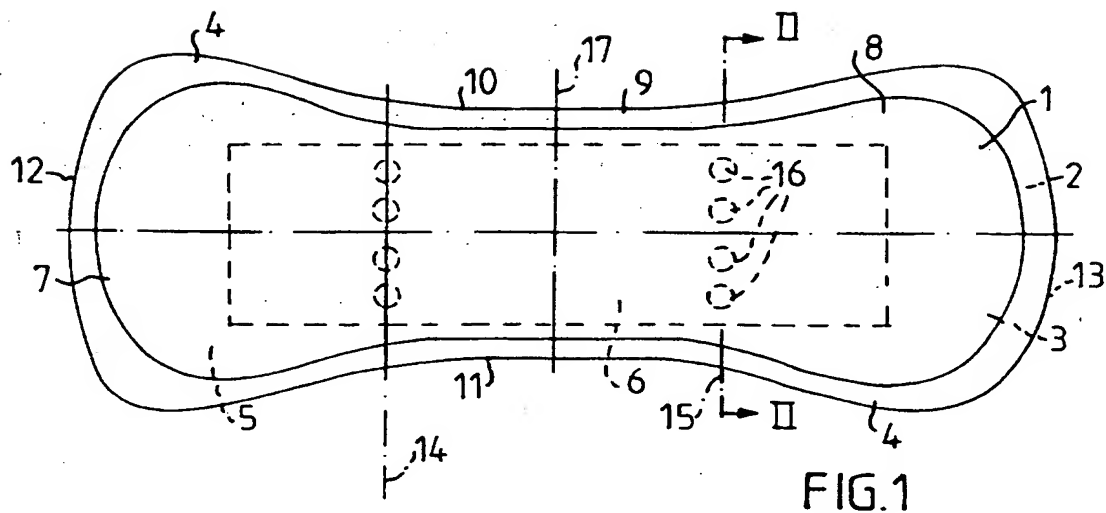
10 12. An article according to Claim 11, characterized in that the article includes an opening (122, 123) or recess which surrounds the point at which the orthogonal fold lines (114, 115, 124) intersect one another in the plane of the article.

15 13. An article according to any one of the preceding Claims, characterized in that the article includes a front part (7, 107), a rear part (8, 108), and a crotch part (9, 109) disposed therebetween, wherein body liquid or fluid discharged to the article is intended to be taken-up primarily within a limited wetting area which is generally located
20 within the crotch part (9, 109), wherein the wetting area is free from fold lines (14, 15; 114, 115) that extend in the transverse direction of the article.

25 14. An article according to any one of the preceding Claims, characterized in that the article includes a fold line (124) which extends along the longitudinal centre line (21, 121) of the article.

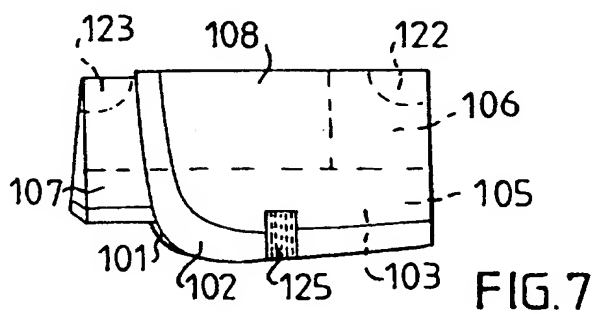
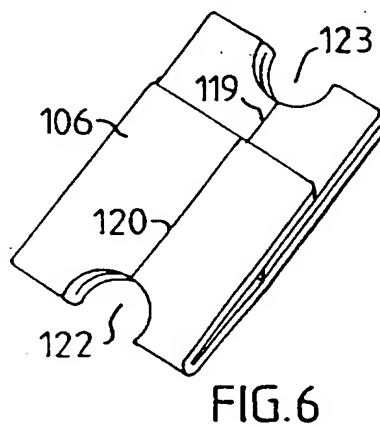
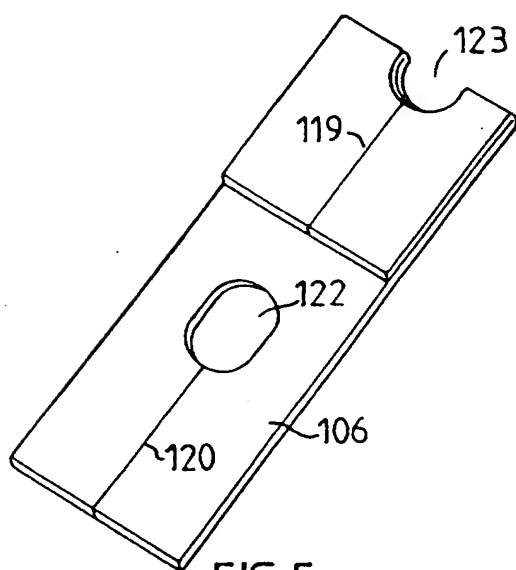
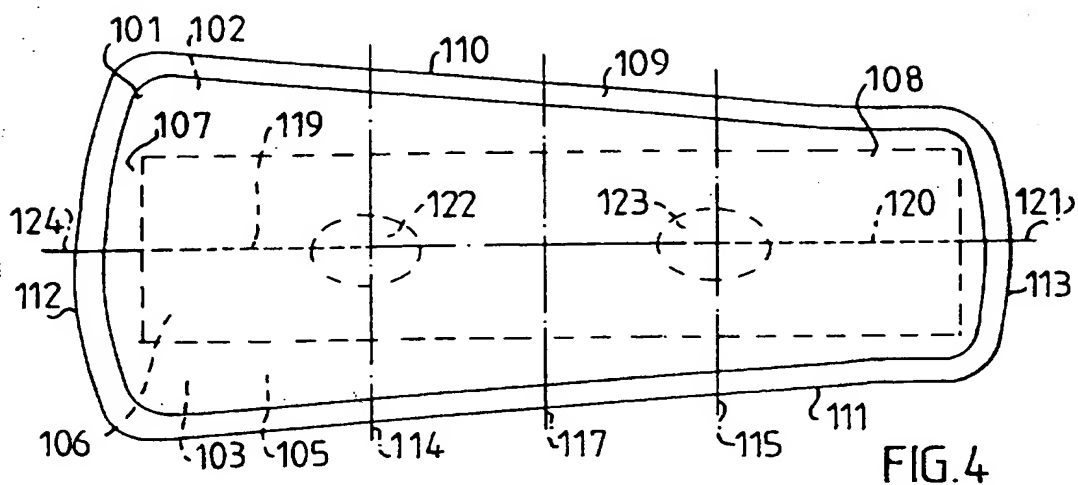
30 15. An article according to any one of the preceding Claims, characterized in that the article includes two transverse fold lines (14, 15; 114, 115) which are placed generally symmetrically on respective sides of the transverse centre line (17, 117) of the article.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 95/01576

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A61F 13/15

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, CLAIMS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4804380 A (LASSEN ET AL), 14 February 1989 (14.02.89), column 5, line 46 - column 6, line 17, figures 32,33,35 --	1-15
X	EP 0605017 A2 (MCNEIL-PPC, INC.), 6 July 1994 (06.07.94), column 5, line 8 - column 6, line 16 --	1,3,6-15
A	-----	2,4-5

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

6 June 1996

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

01/04/96

International application No.

PCT/SE 95/01576

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4804380	14/02/89	AU-B,B- 625733	16/07/92
		AU-A- 2027488	09/02/89
		CA-A- 1306833	01/09/92
		DE-D,T- 3889161	04/08/94
		EP-A,A,A 0302523	08/02/89
		SE-T3- 0302523	
		ES-T- 2051281	16/06/94
		HK-A- 21495	24/02/95
		JP-A- 1070051	15/03/89
EP-A2- 0605017	06/07/94	NONE	

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